

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

BMF1014 – MATHEMATICS FOR FINANCE

(All sections / Groups)

16 OCTOBER 2019

9 a.m - 11 a.m

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of SIX (6) pages including the cover page.
2. Answer ALL questions. The distribution of the marks is given for all questions.
3. Write all your answers in the Answer Booklet provided.
4. Only NON-PROGRAMMABLE calculators are allowed.
5. Selected mathematical formula are provided at the end of the question paper.

Question 1 (25 marks)

- (a) Find an equation of the line passing through (2,-2) and is parallel to another line of $2y - 4x - 16 = 0$. Then sketch the line.

(9 marks)

- (b) A manufacturer sells television sets to stores for \$350 each. Given that the cost of producing each set is \$200, and that the initial set-up cost for the equipment is a one off \$20 000, find:

(i) The cost function. (2 marks)

(ii) The revenue function. (2 marks)

(iii) The profit function. (3 marks)

(iv) Break –even point. (3 marks)

- (c) Find the market equilibrium point for the following demand and supply functions where p denotes the price of the product and q is the quantity demanded and supplied.

$$\text{Demand; } 4p = 3q + 1$$

$$\text{Supply; } 3p = 4q - 6$$

(6 marks)

Question 2 (25 marks)

Consider the following system of equations,

$$x + 2y - z = 2$$

$$x + 2z = 5$$

$$2x + 2y + 2z = 12$$

- (a) Write the system of equation above in matrix equation, $\mathbf{AX} = \mathbf{B}$.

(3 marks)

Continued...

- (b) Solve the system of equation above using the Gauss-Jordan Elimination Method.
(17 marks)

(c) Given $\begin{bmatrix} 1 & y \\ y & 2 \end{bmatrix} + 4 \begin{bmatrix} 1 & 4 \\ x & z \end{bmatrix} = \begin{bmatrix} 5 & 4 \\ 8 & 0 \end{bmatrix}$, find x, y, and z.

(5 marks)

Question 3 (25 marks)

- (a) To buy a computer priced at \$2500 on hire purchase, a deposit of \$100 is paid, and weekly payments of \$20 are charged over three years. Find the total amount that has been paid on the deal.
(5 marks)
- (b) Lily mother's promises to give her RM800 at the end of each month for the next six years her stipend during her study at Multimedia University. How much money should she earn if she keep her 50% of the amount received from her mother to the FGV Bank company that offer a rate of 4.2%, compounded monthly?
(5 marks)
- (c) Find the amount of each quarterly payment to be made into a sinking fund to accumulate RM 200,000 in 10 years at 6% interest per year compounded quarterly.
(5 marks)
- (d) Suppose that $C(x) = 0.006x^3 - 1.3x^2 + 60x + 10400$ is a cost function, where c is the total cost in dollars of producing x units of a product. Find the marginal cost when $x = 20$.
(5 marks)
- (e) The total revenue (in dollars) for selling a product is given by $R(x) = 200x - 0.5x^2$ where x is the number of units sold per day. Find the number of units that must be sold to maximize revenue.
(5 marks)

Continued...

Question 4 (25 marks)

(a) Differentiate the following functions using product rule and quotient rule.

(i) $y = (27 - 8x^3)(x^2 + x)$ (3 marks)

(ii) $y = \frac{6}{4t^2 + 3t - 22}$ (3 marks)

(b) Integrate the following functions:

(i) $\int \left(\frac{12x^{10} - 5x^6 + 3x^2}{x^2} \right) dx$ (3 marks)

(ii) $\int_{-1}^2 (2-x) dx + \int_2^4 \frac{12x}{(x^2-2)^2} dx$ (3 marks)

(c) Given, $f(x) = 4xy - 2y^2 + 4x^2 - 4x + y - 8$.

(i) Find $f_x(x, y)$ and $f_y(x, y)$. (4 marks)

(ii) Find the critical point. (5 marks)

(iii) Determine the nature of the critical point whether it is a relative maximum point, relative minimum point or neither both. (5 marks)

End of Page.

Formula

1. Quadratic Formula

The solution of the equation: $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Mathematics of Finance

a) Simple interest

i) Interest, $I = Prt$

ii) Accumulated amount, $A = P(1 + rt)$

Where P = principal amount, r = interest rate, t = number of years

b) Effective rate of interest, $r_{eff} = \left[1 + \frac{r}{m}\right]^m - 1$

c) Compound interest

i) Accumulated amount, $A = P(1 + i)^n$

ii) Present value, $P = A(1 + i)^{-n}$

where $i = \frac{r}{m}$, and $n = mt$ and m = number of conversion periods per year

d) Future value of an annuity, $S = R \left[\frac{(1+i)^n - 1}{i} \right]$

e) Present value of an annuity, $P = R \left[\frac{1 - (1+i)^{-n}}{i} \right]$

f) Sinking fund, $R = \frac{Si}{(1+i)^n - 1}$

g) Amortization, $R = \frac{Pi}{1 - (1+i)^{-n}}$

3. Rules of Differentiation

(a) Derivative of a constant: If $f(x)$ is a constant, then $f'(x) = 0$

(b) Power rule : If $f(x)$ is x^n , then $f'(x) = nx^{n-1}$

(c) Constant multiple rule: $\frac{d}{dx}[cf(x)] = cf'(x)$ (c is a constant)

(d) Sum rule: $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$

- (e) Product rule: If $f(x) = u(x) \cdot v(x)$, then $f'(x) = u(x)v'(x) + v(x)u'(x)$
- (f) Quotient rule:
$$f'(x) = \frac{d}{dx} \left[\frac{u(x)}{v(x)} \right] = \frac{v(x)u'(x) - u(x)v'(x)}{[v(x)]^2}$$
- (g) Chain rule:
$$\frac{d}{dx} \{g[f(x)]\} = g'[f(x)]f'(x)$$
- (h) General power rule:
$$\frac{d}{dx} [f(x)]^n = n[f(x)]^{n-1} f'(x)$$
- (i) Exponential function:
$$\frac{d}{dx} (e^u) = e^u [u'(x)]$$
- (j) Logarithmic function:
$$\frac{d}{dx} (\ln u) = \left(\frac{1}{u} \right) [u'(x)]$$

4. Rules of Integration

- (a) Indefinite integral of a constant: $\int k \, du = ku + C$
- (b) Power rule: $\int u^n \, du = \frac{u^{n+1}}{n+1} + C$
- (c) Constant multiple rule: $\int k f(u) \, du = k \int f(u) \, du$ where k is a constant
- (d) Sum rule: $\int [f(u) \pm g(u)] \, du = \int f(u) \, du \pm \int g(u) \, du$
- (e) Exponential function: $\int e^u \, du = e^u + C$
- (f) Logarithmic function: $\int \left(\frac{1}{u} \right) \, du = \ln u + C$
- (g) Integration by parts: $\int U \, dV = UV - \int V \, dU$

5. Determining Relative Extremas

$$D(x, y) = f_{xx}f_{yy} - (f_{xy})^2$$

If $D > 0$ and $f_{xx} > 0$, relative minimum point occurs at (x, y) .

If $D > 0$ and $f_{xx} < 0$, relative maximum point occurs at (x, y) .

If $D < 0$, (x, y) is neither maximum nor minimum.

If $D = 0$, the test is inconclusive.